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VIEWS, NEWS AND INTERVIEWS.

Justice Van Wyck, in the Supreme Court, has ordered the tax assessments of the Brooklyn City Railroad, the Brooklyn Heights Railroad and the Edison Electric Illuminating Company to be set aside and new assessments made. He has decided that the assessors were justified in disregarding the companies' figures, but that they should not have based their assessments on the value of franchises and good will.

Mr. W. C. Whitney, representing the Metropolitan Street Railway Company, before the New York State Railroad Commissioners last week, said that the Metropolitan company was ready to spend nearly $6,000,000 this year in work and to begin at once.

Philadelphia is probably the centre of the largest street railway interest in the United States. It is said that of the $28,860,000 of capital stock of the Metropolitan Traction Company, of New York, Philadelphia owns $22,000,000, and that most of this is owned by the four interests represented by Messrs. Widener, Elkins, Dolan and the estate of William Kemble. The latter was the original traction man of these interests. There are other traction interests in Philadelphia, and it is said that Messrs. Charlemagne Tower and J. Lowber Welch and other Philadelphia interests have offered to furnish capital for the new Boston elevated in connection with the steel contracts.

The American Electrical Works sent to a number of its friends on the Fourth of July last a wooden gun. The one at the office of Secretary Porter, of the National Electric Light Association, is suspended on the telephone, and bears the following sign:

"The wise man placeth the butt of the gun against his shoulder before he fireth; but the fool looketh down the barrel to see the balls start."
THIS IS A TOLL TELEPHONE.
A word to the wise is sufficient.

A novel method of lifting a buoyed cable end is described by a writer in a London contemporary. He states that this method has the important advantage of being free from all usual risks to boat and boat's crew, and was successfully adopted on a recent important cable-laying expedition, when the weather was too rough to even allow of a boat being lowered without danger to the men. On this occasion the *modus operandi* was as follows: The ship, a vessel of some 3,500 tons (gross), paid out 200 fathoms of buoy rope, with a centipede grapnel attached to the end of it, the depth of water being 2,800 fathoms, and steamed round the buoy at a distance of about 50 fathoms until the centipede and rope became entangled, as they very soon did, with the buoy moorings, which were then hauled in on the bight, and the buoy then cleared from the bow baulks. By this means, not only was the end of the cable readily brought on board without risk and with very little trouble, but several days of valuable time, which would otherwise have been lost in waiting for the weather to moderate sufficiently, were saved, and the cable was successfully completed. With vessels of smaller dimensions, such as those usually employed for cable repairs, this operation would, no doubt, be still more easily effected. A French telegraph engineer has the credit of being the first to suggest and practically apply this ingenious and novel idea, which is to be commended to the notice of those who are engaged more particularly in submarine cable-laying and repairing work.

The tunnel work of the San Gabriel Power Company, near Azusa, Cal., is being rapidly pushed forward, and, with the cessation of the winter rains, will come a large force of men for excavating and cementing the open conduit. A similar work is being inaugurated near Redlands with the waters of the Santa Ana River, and rumors of a foothill electric road from Los Angeles to Redlands, a distance of 70 miles, to take power from the two generating stations are floating about.

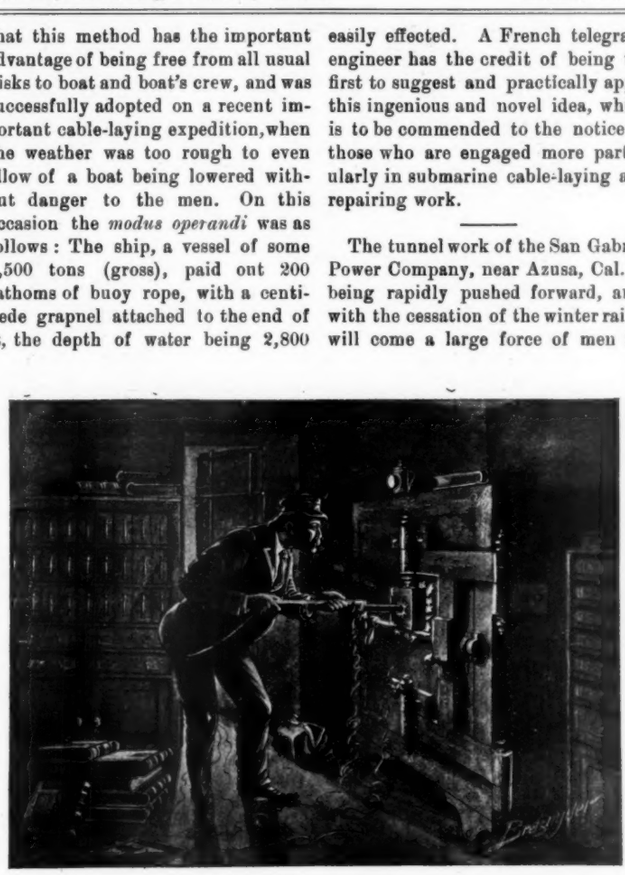


Fig. 1.—The Modern Burglar Attacking a Safe by Electrical Methods.

Chicago Electrical Association.

The next meeting of the Chicago Electrical Association will be held in Room 1737, Monadnock Block, Chicago, at 8 P. M., on Friday, March 19. Mr. Geo. D. Hale, of the Western Electric Company, will read a paper on "Cable Testing". The discussion will be led by Mr. W. B. Hale, and the news items will be opened by Mr. H. P. Clausen.

THE MODERN BURGLAR.

BY CARL E. KAMMEYER.

The first sign of Spring is not the pussy willow, but the burglar. As soon as the snow disappears and the night air loses its keenness—for even a burglar has a care for his health—he begins operations. The audacity with which he carries them on proves that the police are no more an obstacle to him than dogs, locks and window catches.—*New York Evening Sun.*

Since the appearance, a few weeks ago, of our burglar editor's ruminations on burglar proofing safes, and his suggestions regarding a possible means of protection by surrounding the safe or vault by a cage of pipes containing liquid under pressure, the subject has attained increasing attention from the press and public. There seems to be a diversity of opinion, however, even among "experts" and "sleuths", as to what a thoroughly up-to-date burglar can do or can not do. That the ordinary electrical alarm, as applied to safes, rooms or buildings, has no terrors for any burglar, who has taken even a limited course in the burglars' college, will not be denied by any electrical engineer. That he can, with equal facility and with as little fear of detection, burn "hand-holes" through six or more inches of iron, steel or bronze has been ridiculed by one who signs himself "Sleuth", but is probably one of the electrical experimenters he refers to in his fear-allaying effusion. Through the courtesy of the Bankers' Electric Protective Company, Chicago, we are enabled to present to our readers some excellent reproductions from photographs of safes successfully attacked by means of a few feet of wire and a rod of carbon.

The holes that were put into the safes shown were made in less than five minutes in the presence of prominent bankers and electrical engineers. The current was taken from the Edison three-wire incandescent system, and from the 220-volt service. A resistance was employed to reduce current to 250 to 350 amperes, and voltage ranged from 50 to 80 volts.

One of the safes was made of six plates of five-ply drill-proof chrome steel and one plate of soft steel three and one-half inches thick.

The other was made of gun metal,

drill proof, and three and one-half inches thick.

Holes were also put through a seven-inch wall (made of seven plates of five-ply drill-proof steel, each one inch in thickness) in less than 30 minutes.

The current can be reduced to 125 amperes and 40 volts, and do the same work in less than 30 minutes on the three and one-half inch safes.

Cast metal will fuse more readily than iron or steel. Cast metal fuses and runs at 2,000 degrees.

Iron fuses and runs at 2,900 degrees, and the electric current furnishes from 9,000 to 10,000 degrees of heat.

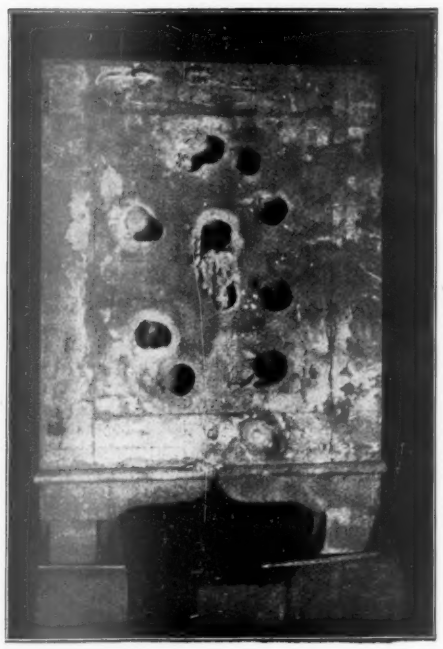


FIG. 2.—SAFE COMPOSED OF SIX PLATES, FIVE-PLY DRILL PROOF STEEL AND PLATE OF SOFT STEEL, ENTERED IN TWO MINUTES BY MEANS OF THE ELECTRIC ARC.

FIG. 3.—SPHERICAL SAFE OF GUN METAL THREE AND ONE HALF INCHES THICK, ENTERED BY MEANS OF THE ELECTRIC ARC IN ONE AND ONE HALF MINUTES.

Any person can use a current from a trolley line or electric light wire. When current is taken from such sources it is, of course, apparent to any electrician that resistance can be used to cut down the current and voltage to the required amount.

There is no doubt whatever that any intelligent disciple of Fagin would soon become proficient enough in the art of tapping water or other pipes under pressure, and attaching a pressure guage, ascertain the amount of pressure necessary to maintain a "shunt" around the pipe system, without disturbing the most sensitive alarm. The automatic burglar alarm, in order to be successful, must call electricity to its aid. The Chicago company referred to seems to have developed a system of electrical protection which would make it appear a waste of time to try and invent something more effective. The company does not depend upon secrecy in locating its wires or alarm gongs, but makes the public do police duty rather than depend upon watchmen at a distant station, where there is always possibility of collusion. The alarm gong and apparatus, consisting of relay and polarized switch instruments, as well as batteries, are inclosed in a substantially constructed, weather-proof, steel box, placed upon an ornamental structure located in front of a building, or wherever desired.

Where it is desired to protect a vault, it is first lined with steel, then with an electric lining, which consists of alternate layers of insulating material, tin-foil conducting strips, and finally with a light steel lining to protect the inside from mechanical injury. The vault entrance is protected with quarter-sawed oak doors and jambs, provided with electric lining and contacts, for the purpose of conveying electric current to the door lining when closed.

The alarm box, mechanically strong, is also electrically lined throughout and connected to the vault or cabinet by means of a braided cable, consisting of 13 diminutive strands of wire, each separately insulated and braided together. (See illustration.)

This combination forms a labyrinth of circuits, all interwoven, making it a physical impossibility to insert any electrical instrument, resistance, or device, for the purpose of disconnecting and rendering the system inoperative. The breaking or cutting of any of the wires, or bringing into contact of any two of opposite polarity, or those possessing a difference of potential, will cause an alarm. Drilling, cutting or interference of any kind with vault lining, safe covering or alarm box will produce an alarm. The system is controlled by a chronometric time-lock switch, which diverts the electric current from vault entrance or roller curtains of safe cabinet, after the expiration of the time for which it has been wound, so that access to the vault or safe may be had by the proper parties without causing an alarm. This time lock, also galvanometer, resistance coils, push buttons, terminal board and batteries, are placed in a steel box inside of vault or safe cabinet. An indicator instrument outside of the guarded structure shows if current to entrance of safe or vault has been switched on at night and thrown off in the morning. This instrument is left in circuit during the day to show the condition of the system.

The company's customers are supplied with addressed postal cards, to be used for stating position of indicator needle. With this precaution no part of the system can become deranged without timely warning being given, so that readjustment can be at once effected. Adequate provisions have been made against moisture or any atmospheric influences on the alarm box or instruments therein contained.

Now let the inventors, burglar editors, sleuths, electrical experts and others step forward with a system to beat this modern automatic burglar alarm.

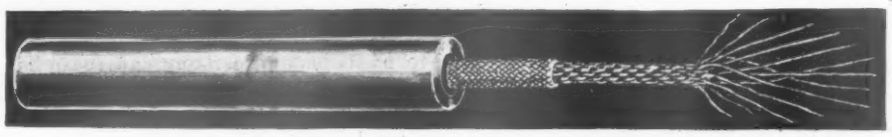


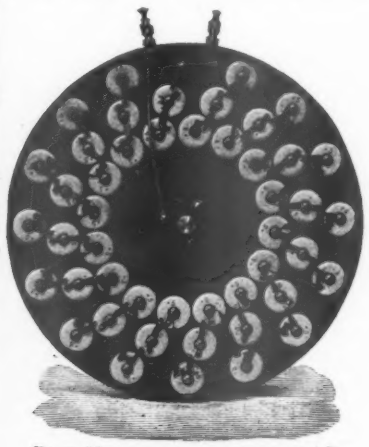
FIG. 4.—BURGLAR-PROOF ELECTRIC CABLE.

The "Universal" Enamel Rheostats.

It is well known that enamel rheostats are very compact for a given capacity, are entirely fireproof (meeting all the demands of the insurance requirements), have high insulation, and are an appurtenance to the up-to-date switchboard. In an endeavor to overcome what has been considered objections to the present market product, and at the same time preserve all the advantages of the best that has been procured, the American Electric Heating Corporation, of Boston, have ready for market a line of dynamo field rheostats called the "Universal", which, it is believed, will demonstrate that they have accomplished the desired results.

The rheostats consist of circular cast-iron plates, on which are placed a sufficient number of enameled steel disks containing resistance to provide the necessary number of divisions and total resistance required. These disks are of uniform size, but vary between wide limits in resistance and ampere capacity.

The cast-iron supporting plate is provided with suitable holes, which permit a single bolt to clamp the connections, disks and plate firmly together, and the bolt heads form the contact points over which the usual movable arm rotates. By this method of placing the resistances, one or more rows of contacts may be arranged, thereby distributing the resistance over a greater surface of a given sized plate than has been the practice



BACK VIEW OF THE "UNIVERSAL" ENAMEL RHEOSTAT.

where all the resistance is located outside the circle of the contact points. In the event of injury to any part of the circuit it would require but a few moments' work of the dynamo tender to locate the fault, remove or cut out the defective part, and continue the use of the rheostat, instead of having to procure a new rheostat.

The possibility of "burn-outs" is very slight, and cost for repairs nominal. No disk can ever have more than its predetermined load, and the factor of safety allowed is large. Each customer can have exactly the rheostat required for his dynamo. Special rheostats within the limits of sizes made can be furnished at once. By reason of there being few sizes of plates required to meet all demands, for an infinite combination of resistances, no delay need occur in filling orders, for the average rheostat can be assembled in an hour, and it is a simple matter to keep an assortment of resistances complete.

All field rheostats for mounting on back of switchboard are made so that the holes drilled for one will answer for any size, so if it is desirable at any time to change from one size to another, it would involve no change in the supporting bolts or their location.

Quite an important feature is that, if by carelessness an excessive overload is applied and allowed to remain to the point of causing a "burn-out," no serious harm could be done, for at most but two or three of the disks could be injured.

THE DIEHL MANUFACTURING COMPANY'S NEW ELECTRIC FANS.

LATEST DESIGNS IN CEILING AND COLUMN FANS.

The Diehl Manufacturing Company, of Elizabethport, N. J., makers of the well known Diehl motors, dynamos, electric fans and arc lamps, have prepared for the season of 1897 a remarkably complete and efficient line of electric fans of all types and many designs suitable for any service. These fans are wound for all currents except alternating. The quality of the Diehl product is shown in the statement of the manufacturers, that in every competitive test in which these fans have been entered they have won.

FIG. 1.—THE DIEHL FOUR-BLADE CEILING FAN.

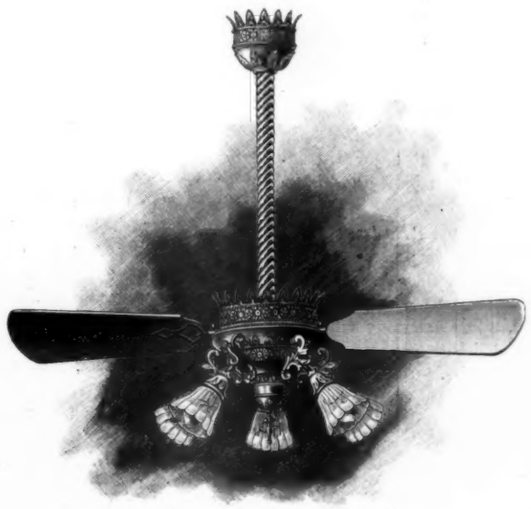


FIG. 2.—THE DIEHL ELECTROLIER CEILING FAN.

In the accompanying illustrations are shown three of the new fans just placed upon the market by this company. In Fig. 1 is shown a four-blade ceiling fan with a stopping and starting switch. Fig. 2 illustrates an electrolier ceiling fan, and in Fig. 3 is shown a column fan. A counter column fan, of the same general design as Fig. 3, is also made by the Diehl company. The regular finishes of these fans are polished brass, nickel, and japan. Special finishes are also produced as follows: White enamel and brass, oxidized copper or silver, antique copper, old brass, rich gilt, and light bronze.

The electrolier ceiling fan, shown in Fig. 2, is ornamented with solid cast-brass work, making a very rich and elegant fixture, designed especially for use in the finest restaurants, cafés, club houses, and hotels. In the Winter time, when the fan blades are removed, the electrolier makes a very handsome fixture for lighting purposes.

As a rule all the Diehl ceiling and column fans are so made that the blades will be seven feet ten inches from the floor. Each fan contains its own motor, directly coupled to the fan shaft, and is provided with an improved oil cup and indestructible commutator. The standard windings are as follows: Direct incandescent circuits up to 125 volts; direct incandescent power and street railway circuits up to 500 volts; direct arc current of 6.8, 9.6, or 18 amperes. On 500-volt circuits the Diehl fans may be operated successfully singly or in series of two fans, each wound for 250 volts; three fans, each wound for 170 volts; or four fans, each wound for 125 volts.

The Diehl Manufacturing Company has been doing, for some time, a large business in supplying slow-speed standard motors, directly connected to all the well known types of blowers. The sizes of wheel used run from 18 inches in diameter to 60 inches in diameter, exhausting from four to 55.6 cubic feet of air per minute. The Diehl motor, on account of its efficiency and slow speed, is especially adapted for this work, in which it is rapidly achieving well-merited popularity.

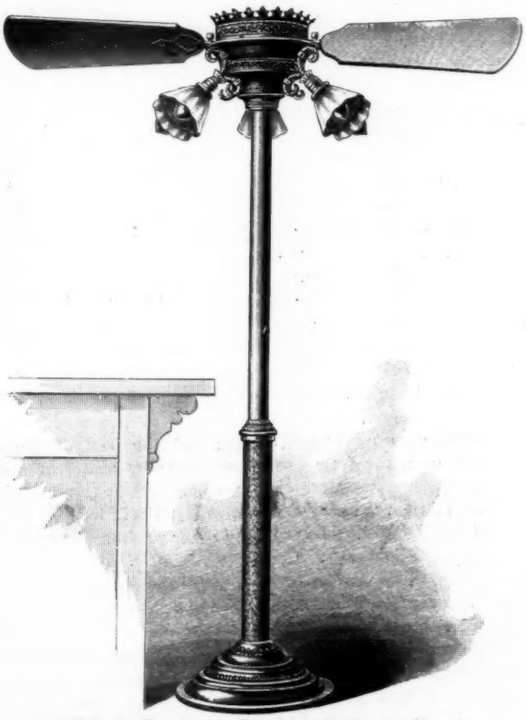


FIG. 3.—THE DIEHL ELECTROLIER COLUMN FAN.

A new catalogue and folder have just been prepared by the Diehl Manufacturing Company, describing their air-agitating apparatus, both of which will be sent, upon request, to any one interested.

ELECTRIC RAILWAY NOTES.

In 1891 there were only three cities in Germany supplied with electric railways. Now there are 40.

The Newton, Mass., Street Railway Company will commence work on its new line to Bemis and Nonantum this week.

The Hudson, N. Y., Electric Railway has been sold under foreclosure proceedings to local capitalists, who will form a new company. The price was $55,000.

A receiver has been appointed for the Consolidated Building and Savings Company, of Cincinnati, Ohio. The liabilities are placed at $230,000; assets, $175,000. The shareholders are mostly employés of the Cincinnati Street Railway Company.

The Crosstown Street Railway Company, of Buffalo, N. Y., will build a car-house at the corner of Hertel avenue and the Military road, at a cost of about $15,000.

Senator Humphrey has introduced a bill affecting street railroad companies of Chicago, Ill., which provides that the companies are to pay the city a lump sum of $2,000 for each mile of street occupied, the rate of fare to remain unchanged for 40 years.

It is reported that an English concern has secured the right to build and operate an electric railway from the ancient city of Cairo, Egypt, to the still more ancient Pyramids. The work has been begun, and in a few months the old-style camel transportation will be abandoned.

At the annual meeting of the Long Island, N. Y., Electric Railway Company A. R. Hart was re-elected president. The other officers are M. Auerback, vice-president; A. G. Greenberg, treasurer; J. C. Von Arx, secretary. The directors elected are A. R. Hart, Charles A. Porter, M. Auerback, William L. Wood, A. G. Greenberg, Charles H. Mullen, F. M. Harris, J. C. Von Arx and Joseph Hogan.

The Calumet Electric Street Railway, Chicago, has asked the City Council for permission to extend its lines east in 120th street to Butler street, thence north to 117th street, and thence east to Wentworth avenue. The company also obtained an ordinance giving it the right of way in the block from Ninety-third street to South Chicago avenue in Erie avenue, which will enable it to connect the two lines entering South Chicago.

The Hanover National Bank, of New York city, has secured the entire issue of the $60,000 receiver's certificate Series A, against the property of the Chicago & Englewood, Ill., Electric Street Railway at par, less two per cent commission. The certificates bear seven per cent interest, and run two years, but may be redeemed at any time. After 30 days' notice the receiver is authorized to issue $265,000 additional certificate Series B, which will be a second lien.

The New York *Sun*, in giving a list of 10 American men whose names will be likely to live longest in history, includes those of Franklin and Morse.

CHICAGO BUSINESS NOTES.

The Safety Car Gate Company, Chicago, filed incorporation papers on the 1st inst. The capital stock is $25,000. Among the incorporators are Louis E. Myers, A. S. Littlefield, Wm. C. Pullman and others.

Kohler Brothers, Monadnock Block, are busy putting the finishing touches on some large installations of the Gibbs Electric Company's apparatus, whom they have been successfully representing for some time past.

The Dearborn Electric Company is busy preparing for its coming removal (on the 15th inst.) to new and larger quarters, at 330 Dearborn street, where it will enjoy the advantages of a much better and more accessible location.

The Consolidated Rail Joint Company has been incorporated by Edward P. Caldwell, Geo. A. Cobb and Geo. W. White, with a capital stock of $25,000. The company will manufacture rail joints and other street railway specialties.

The Wallace Electric Company is having a suite of offices prepared for it on fifteenth floor of the Marquette Building, which is rapidly becoming another center for electrical firms. Mr. J. P. Wallace has just returned from a business trip through Missouri, and is very much gratified with the result of his trip.

Signs of Spring—While the present raw and chilly weather smacks more of Winter and frigidity, the Central Electric Company seems to have great faith in the return of Summer and its accompanying rise in temperature, as well as the annual visits of the genus diptera. This explains the company's active preparations for the coming fan-motor trade. A new and handsome catalogue of these goods is in press, and, besides a complete line of the well known Lundell goods, will contain several new and acceptable specialties in the way of ceiling fans and other atmosphere agitators.

The General Electric Company is giving a most interesting exhibit of the company's Roentgen-ray apparatus, at Room 1063, Monadnock Building, where the apparatus is in operation daily, from 9 A. M. to 12 M., and from 2 to 5 P. M. Neat invitations have been sent out to the medical profession and others interested. Mr. Martin P. Rice, from the company's works at Schenectady, is in charge of the apparatus, which, of course, is of the latest improved type. A motor-generator is used to reduce the voltage from the Edison lighting circuit of the building to a proper pressure for the coil. This is of great advantage in doing away with the large number of batteries usually employed.

The Metropolitan Electric Company has just secured the agency for the products of the C. O. White Company, Worcester, Mass., consisting of the patent adjustable ceiling and wall fixtures for incandescent lamps. These fixtures have been in use for some time in several of the largest establishments of the country, and have proved of great advantage in machine shops, factories, workrooms or, in fact, any place where frequent shifting of lamps may be necessary or desirable. They can be adjusted to an almost endless variety of positions, and their great range of movement, smoothness and ease of action, as well as the ability of retaining the lamp and shade at any angle, make them not only a desirable requisition to any establishment, but at the same time will prove very economical in the use of lamps. Among the many prominent concerns already using them, I note the Washburn & Moen Manufacturing Company, Worcester, Mass.; R. Hoe & Company, New York; Westinghouse Machine Company, Pittsburgh; Wagner Palace Car Company; Pond Machine Tool Works, and others.

The Western Telephone Construction Company seems to be one of the opposition companies who are doing a profitable and increasing business. It has just sold a complete equipment to the Natchez, Miss., Telephone Company, who will start in with a 200-line outfit. It is also shipping one of its latest improved type, 500-drop switchboard to the Bloomington, Ill., exchange. This board is equipped for metallic circuits. Mr. J. G. Nolan, one of the company's experts, has just returned from an extended trip through the southern States, and speaks in rather emphatic language of the cheap and slip-shod manner in which some of the telephone exchanges have been built. He states that in a large city in Louisiana the entire exchange, with a capacity of 500 subscribers, has had to be entirely remodeled within the past year. Similar cases he found in several towns in Arkansas. This, he explains, is one of the chief reasons why so many of the would-be rivals to the Bell company have failed. Mr. Nolan is very enthusiastic on the subject of his company's apparatus, and says there is nothing "cheap" about it.

C. E. K.

A New Electric Line Between New Britain and Hartford, Ct.

The Central Railway & Electric Company, of New Britain, Ct., after a long fight, have secured a special charter from the State of Connecticut, which allows them to complete their road from New Britain to Hartford, a distance of 10 miles. Judge F. B. Hall has granted a decree of public convenience and necessity, which frees this company from any further legal complications which have been put in their way by the Consolidated (New York, New Haven & Hartford Railroad) Company. The public demand for this road in New Britain and Hartford is practically unanimous. Mr. A. M. Young, of Waterbury, is president of the Central Railway & Electric Company; Mr. C. S. Landers, of New Britain, is secretary; Mr. F. G. Platt, of New Britain, is treasurer, and Mr. E. S. Breed, of New Britain, is general manager. There are over 300 men at work on the construction of the road, which is to be completed by June 1, and when finished it will be one of the best equipped and most modern suburban electric lines in the United States.

Animal Electricity.

At the Royal Institution, recently, Dr. Waller mainly devoted himself to the experimental demonstration of the electrical effects that go with muscular action, taking the heart as the most convenient and typical muscle for that purpose, says the London *Electrical Engineer*. Normal muscle at rest gives no current from one part to another—it is isöelectric. If injured, the direction of the current (in an exterior circuit connecting them) is from the uninjured to the injured part. When the uninjured muscle is at work the direction is to the part in action from the part at rest, or acting less vigorously—that is, the portion in which for any reason there is greatest chemical change taking place acts to the other parts like the zinc which is attacked in a galvanic cell. (This statement contains at once the origin and justification of Dr. Waller's new term, "zincative.") In the heart the muscular contraction begins at the base and ends at the apex. It was shown with an isolated frog's heart and a capillary electrometer that at the beginning of the contraction the potential of a terminal connected to the base of the heart is higher than that of one to the apex, and at the end lower, while between the two effects there is a period of no potential difference corresponding to the whole organ being in a contracting state. The effect of a typical heart reagent, muscarine, was also demonstrated. On exhibition of the drug the frequency of the pulsations fell rapidly, and they ultimately ceased altogether. A notable point in the experiment (whether it is a constant phenomenon, with a meaning attached to it, or an accident of the arrangement of the instruments, the writer does not know) was that the amount of the muscular movement of the imperfect or incomplete pulsation decreased much more rapidly than that of the electrical effect corresponding to it. Although on consideration it will be seen that the attachment and contacts of the heart in the pericardium somewhat facilitate the matter, it will be to most people somewhat of a surprise that a difference of potential on the surface of the body due to the difference of potential between the apex and the base of the heart is measurable by means of a capillary electrometer. It can be done with a human subject, but for anatomical and other reasons a dog is better, and when, like Dr. Waller, you have one that will stand with his fore and hind feet in basins of salt and water, it is possible to connect up with the capillary electrometer and show the effect on the screen.

KIND WORDS.

A SUBSCRIBER FOR FIFTEEN YEARS.

To the Editor of Electrical Review:

Inclosed please find post office order for $3 for Electrical Review for one year. I have taken the Review for about 15 years, and would be lost without it.

J. R. Barre.

March 1.

The Effect of Electricity On Seeds.

In a recent report from the Hatch experiment station of the Massachusetts Agricultural College, at Amherst, Mass., is a paper by Mr. Asa S. Kinney, on the effect of electricity on seeds. His conclusions are as follows:

1. Electricity exerts an appreciable influence upon the germination of seeds.

2. The application of certain strengths of current to seeds for short periods of time accelerates the processes of germination.

(*a*) As a result of experiment, it has been found that at the end of 24 hours over 30 per cent more seeds were germinated in the treated lots than in the normal. At the end of 48 hours about 20 per cent, and in 72 hours six per cent.

3. Those lots of seeds, receiving electrical stimulation gave a higher percentage of germination than the normal.

4. The range in the strength of current which accelerates germination is exceedingly limited.

5. The effect of electricity upon the germination of seeds shows that there is a maximum, optimum and minimum current.

6. The minimum strength of current, which just perceptibly accelerates germination when an interrupted induced current is used, probably represents considerably less than one volt.

7. The optimum strength of current, which shows the maximum growth of radicles and hypocotyls, is equal to about three volts where an interrupted induced current is used.

8. The maximum current which the seed germ can withstand without being destroyed has not been ascertained in these experiments, but probably represents a comparatively high voltage.

9. The optimum strength of current is practically constant for such small seeds as mustard, red clover, etc.

10. The optimum current for radicles and hypocotyls is the same.

11. Seeds subjected to but one application of electricity show the effect only for a few hours.

(*a*) In those lots of seeds which received an optimum strength of current, an increase of over 30 per cent in the length of radicles was found at the end of 72 hours, while at the end of 96 hours this increase was less than 15 per cent, showing that the beneficial effect was lost as the plants matured.

(*b*) The gain in the hypocotyls by use of an optimum current was about 13 per cent, or a little less than that of the radicles in the same lots of seeds.

12. Electricity, when applied hourly to germinating seeds or growing plants, does not lose its effect, but acts as a constant stimulation to their growth and development.

A bill has been introduced at Springfield, Ill., to prohibit demands of deposits of money to secure payment of water, gas and electric light bills,

An Underground Railway for Chicago.

If the intentions of the Cook County Terminal and Railway Company are carried out, after the necessary ordinance has been secured, Chicago will, at no very distant day, have an underground loop in the downtown district, connecting with the several systems of elevated railways, and touching every depot in the city. An ordinance to that effect was introduced in the City Council last week, and is most sweeping in its provisions. It provides in brief that the company be granted the right to construct, operate and maintain in any portion of the city an underground railway system; further, that it may construct in any part of the city, outside the district bounded by Twelfth street, the south branch of the river and North avenue, an elevated railway system in connection with the underground line; further, that it may construct, own or lease docks, warehouses and sidetracks along the river, slips, canals or lake, and that it may construct, dredge or locate slips, channels or harborage adjacent to docks owned or controlled by it.

No route is prescribed for either the underground or elevated portions of the proposed road, but it is stated by those in favor of the ordinance that the scheme is to connect the passenger stations and freight depots of all the railroads entering Chicago, and all points along both branches of the river, and the wharves along the lake front now existing or hereafter to be established.

The measure provides for no compensation for the city. The company merely is required to furnish a bond of $100,000. The company must construct two miles of its underground system within two years, and four miles within five years, after accepting the ordinance.

It is provided that the company may have two or more tracks, and may use electricity or any other motive power. When the company constructs its line under the streets, it is required to keep within the curb lines. The life of the franchise is fixed at 50 years. Suitable provision is made for the construction of entrances, stations and platforms to both underground and elevated roads, and for proper ventilation.

The materials and mode of construction of the tunnel and all the appurtenances are specified at length, and provision made for proper indemnification.

The scheme as outlined is little short of stupendous, and it is, of course, too early to predict with any degree of certainty what the outcome will be. However, with the Illinois Central road quietly gathering data covering cost and operating expenses of all sub and interurban electric roads, and several other roads, who do more or less of a suburban business, having more than once been confronted with the coming necessity of adopting electricity on their suburban lines, it looks very much as if a combination representing the various steam railroad companies having terminals in Chicago are seeking the passage of the measure.

PERSONAL.

President John E. Hudson, of the American Bell Telephone Company, Boston, visited New York city last week.

Mr. Harry C. Adams, Jr., of the Phillips Insulated Wire Company, Pawtucket, R. I., was among the visitors to New York city last week.

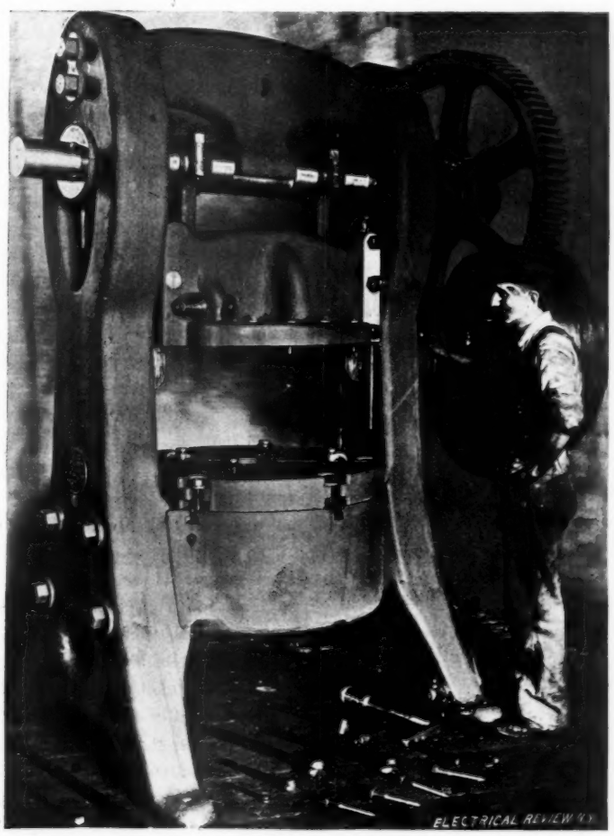
Mr. Charles E. Perring, the well known designer of electric and gas fixtures, is now at 50 East Twentieth street, New York. Mr. Perring is one of the leading artists in his field.

Mr. John A. Brill, the handsome and versatile exponent of high-class electric car manufacture, came over from Philadelphia a few hours last week to visit his friend, Mr. H. M. Littell, of the Metropolitan Street Railway Company. The many friends of Mr. Brill will be glad to learn that he is almost entirely recovered from his recent severe illness.

The following named out-of-town visitors were registered at the office of the National Electric Light Association, for the week ending March 12: C. S. Knight, Fort Wayne, Ind.; D. D. Dickey, Pittsburgh, Pa.; W. C. Ballda, Utica, N. Y.; J. Wilson, Boston, Mass.; Samuel Insull, Chicago, Ill.; J. J. Burleigh, Camden, N. J.; H. Brooks, Boston, Mass.; E. F. Phillips, Providence, R. I.; H. C. Adams, Jr., Pawtucket, R. I.

Double-Crank Cutting Press for Large Armature Disks.

The accompanying illustration shows a press especially adapted for large armature disks, which has been introduced by the Ferracute Machine Company, of Bridgeton, N. J. They make a variety of presses in all sizes, from 34 inches up to 100 inches between columns, and with both square, oblong and round beds, and they are built from heavy and light patterns, and with and without gearing, as required for various kinds of work. There are about 120 sizes of these presses all told, and they are carefully and accurately fitted up with an improved form of automatic steel clutch, new form of adjustment for the ram, treadle lock, safety lock, self-oiling device for flywheels, etc.



Double Crank Cutting Press for Large Armatures.

The dies generally used in these presses are arranged so they will cut the armature disk blank in plain circular form, with center hole and notch, and the teeth in the disk are afterwards cut in a special indexing machine, which is adjustable for various numbers and sizes of teeth, and for all sizes of disks from three inches to 36 inches in diameter.

They make a specialty of presses and dies for electrical work, and have furnished outfits to many of our largest manufacturers. The press shown is known as SG 52; the weight of it being 14,100 pounds; distance between columns, 40 inches; hole in bed, 28 inches; size of flywheel, 40 inches; weight of wheel, 1,000 pounds. Further information about this press, and various other presses, will be found in the handsome catalogue issued by the Ferracute Machine Company.

"W.-S." X-Ray Plants.

Mr. James G. Biddle, Drexel Building, Philadelphia (sole agent for Messrs. Willyoung & Company), has been very successful in securing a large number of orders for the now widely known "W.-S." X-ray apparatus. The most expensive part of an X-ray outfit is the induction coil, and this very important piece, as made by Willyoung & Company, is said to be remarkably effective and enduring. In addition to the adjustable condenser invented last year by Mr. Willyoung, a new improvement has been introduced in the "Ideal" automatic interrupter just placed on the market. It is claimed that only about one-half the amount of current is required to energize a coil, as the Apps or other forms of hammer head vibrators require. Furthermore, the "Ideal" interrupter does away almost entirely with sparking at the platinum contacts and can be operated continuously without sticking. It can be connected to any direct current up to 110 volts, if the primary current is regulated by a suitable rheostat, but without necessity for rotary or mechanical brake of any kind. The makers claim this to be the first automatic interrupter that can be safely connected to a 110-volt circuit in the manner indicated. Other parts of these equipments are equally meritorious as the induction coils, and interested parties should avail themselves of Mr. Biddle's offer to mail his new X-Ray Catalogue No. 200 upon request. A few of the recent orders received by Mr. Biddle are from the Episcopal Hospital, Philadelphia; Jefferson Hospital, Philadelphia; German Hospital, Philadelphia; Girls' High School, Philadelphia; Emergency Hospital, Washington; West Penn Hospital, Pittsburgh; Williamsport Hospital, Williamsport, Pa.; Catholic University, Washington; Hospital, Alton, Ill.; Hospital, Boise City, Idaho; College of Medicine, Cincinnati; Hospital, New London, Ct.; Hospital, Lancaster, Pa., etc.

Edison Earnings.

The earnings for February of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1897.	1896.	Increase.
Gross	$212,803 96	$195,221 23	$17,582 73
Net	106,007 63	93,434 37	12,573 26
Gross, two months	453,103 01	413,402 77	39,700 24
Net, two months	230,551 13	200,289 57	30,261 56

The Edison Electric Illuminating Company of Brooklyn, N. Y., February statement shows:

	1897.	1896.	Inc.
Gross	$69,817	$69,419	$398
Net result	29,880	28,857	945
Interest	4,166	4,166	....
Net for dividends	25,636	24,600	945

A New Fluorescent Material.

A new fluorescent material, much superior to all those hitherto used, has been discovered by Dr. Van Melckebeke, of Antwerp, says the New York *Sun*. It is composed of oxyfluoride of uranium and ammonium. By his process 128 grains of crystals can be made for 87 cents.

Electrical Review

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Special Notice to Advertisers.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.

NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, MARCH 17, 1897.

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A report from Chicago states that some of the patrons of crosstown lines fear that if the street railway companies are compelled to place fenders on the trolley cars, the companies will be expecting the passengers to make use of the available standing room on the fenders.

SCIENCE AND THE "NEW JOURNALISM."

The sensational daily press, and especially its old and new exponents in New York city, have much to answer for according to the older and better established dailies, and also according to the opinion of every man of taste and discernment. The trend of the "new journalism," as it has been aptly characterized, is toward ultra sensationalism. Nor do its efforts cease here. The slightest pretext is seized to dilate upon a scientific discovery to the extent of making its author a laughing stock among his fellows, were it not becoming understood that the "new journalism" is at all times unreliable.

The latest of many flagrant examples is that of Mr. Willard C. Case, of Auburn, N. Y., who recently read a paper on "Electricity From Carbon Without Heat" before the New York Electrical Society. It is as well to state here that Mr. Case is a gentleman of wealth, who is not obliged to earn his living from electrical pursuits, but one who follows the science for the pure love of it. Consequently, such unenviable notoriety as he has achieved at the hands of the primary department of the "new journalism" must be extremely distasteful to him.

In his lecture Mr. Case distinctly stated that the form of carbon electric generator which he had devised, and which he then exhibited, was not a commercial apparatus. On top of this positive assertion, the New York *Journal* on the following Sunday printed a page story, embellished with foolish pictures, designed to lead the layman to believe that Mr. Case's battery was available to furnish power for transatlantic steamships. Some of the pictures showed the ships thus equipped. Even from a "new journalism" standpoint, this story was incomplete. The paper failed to announce that while Mr. Case was in New York city he stopped at the Hotel Waldorf, no alleged portrait of him was published, the bed he slept in was not pictured, nor were other details of a private nature disclosed.

The kinetoscope, first cousin to the phonograph, is, if all accounts are true, about to make its record in depicting the great battle at Carson City. Speaking of battles, what a future there is for this kinetoscope and its rivals, in making a real panoramic record of actual battles between opposing armies. Think of the charge of the Light Brigade, or Pickett's charge at Gettysburg, or any one of a hundred similar scrimmages in past wars, being now thrown upon the screen. It would be very instuctive, to say the least.

THE NEW TELEGRAPHY.

AN INTERVIEW WITH SIGNOR MARCONI, REPORTED IN "M'CLURE'S MAGAZINE" FOR MARCH, BY H. J. W. DAM.

Guglielmo Marconi, whose name will doubtless be often heard in the years which lie before us, is a young Anglo-Italian. He was born in Bologna, Italy, and will be 22 years old next April. His father is an Italian gentleman of independent means, and his mother is an English lady connected with several well known English families. He is a tall, slender young man, who looks at least 30, and has a calm, serious manner and a grave precision of speech, which further give the idea of many more years than are his. He is completely modest, makes no claims whatever as a scientist, and simply says that he has observed certain facts and invented instruments to meet them. Both the facts and the instruments are new, and the attention they are at present exciting is extraordinary.

This attention is largely due to the enterprise and shrewdness of Mr. W. H. Preece, the able chief of the electrical department of the British postal system. Marconi's invention is a year old, but he could obtain no satisfactory recognition of it in his own country. Mr. Preece, however, had for a long time been at work upon the problem of telegraphing through the air where wires were not available. Last year the cable broke between the mainland and the island of Mull. By setting up lines of wire opposite each other on the two coasts, he was enabled to telegraph by induction quite successfully over the water and through the air, the distance being four miles and one-half. He sent and received in this way 156 messages, one of them being 120 words in length. Ordinary Morse signals were used, the dispatches being carried by the ether in the air. In a late lecture at Toynbee Hall, Mr. Preece admitted that Marconi's system, which is electro-static, far surpassed his own, which is electro-magnetic. He expressed the fullest faith in Marconi, describing his inventions as new and beautiful, scientifically speaking, and added that he (Mr. Preece) had been instructed by the postal department to spare no expense in testing them to the fullest degree. It will be understood, therefore, that it is due to Mr. Preece that Marconi has received the fullest recognition in England and that engineers from four different departments of the English Government are now supervising his work.

Marconi was educated at Leghorn, Florence and Bologna, and has more recently been following his special study at his home in the last named city. He speaks English perfectly, and said, in his London home, in Westbourne Park: "For 10 years past I have been an ardent amateur student of electricity, and for two years or more have been working with electric waves, on my father's estate at Bologna. I was using the Hertz waves from an apparatus which you may photograph, a modified form of the apparatus for exciting electric waves as used by Hertz. My work consisted mainly in endeavoring to determine how far these waves would travel in the air for signaling purposes. In September of last year, working a variation of my own of this apparatus, I made a discovery."

"What was the discovery?"

"I was sending waves through the air and getting signals at distances of

a mile, or thereabouts, when I discovered that the wave which went to my receiver through the air was also affecting another receiver, which I had set up on the other side of the hill. In other words, the waves were going through or over the hill."

"Do you believe that the waves were going through the hill?"

"That is my present belief, but I do not wish to state it as a fact. I am not certain. The waves either went through the hill or over it. It is my belief, based on many later experiments, that they went through."

"And what was the thickness of the hill?"

"Three-quarters of a mile."

"And you could send a dispatch with Morse signals through this hill or over it to some one on the other side?"

"With ease."

"What followed?"

"What followed was the conception and completion of my special invention, the instruments I have been using at Salisbury Plain in the presence of the Royal Engineers. I find that while Hertz waves have but a very limited penetrative power, another kind of waves can be excited with the same amount of energy, which waves, I am forced to believe, will penetrate anything and everything."

"What is the difference between these and the Hertz waves?"

"I don't know. I am not a scientist, but I doubt if any scientist can yet tell. I have a vague idea that the difference lies in the form of the wave. I could tell you a little more clearly if I could give you the details of my transmitter and receiver. These are now being patented, however, and I can not say anything about them."

"How high an alternation were you using?"

"About 250,000,000 waves per second."

"Do these waves go farther in air than Hertz waves?"

"No. Their range is the same. The difference is in penetration. Hertz waves are stopped by metal and by water. These others appear to penetrate all substances with equal ease. Please remember that the amount of exciting energy is the same. The difference is in the way they are excited. My receiver will not work with the Hertz transmitter, and my transmitter will not work with the Hertz receiver. It is a new apparatus entirely. Of course, the waves have an analogy with the Hertz waves and are excited in the same general way. But their power is entirely different. When I am at liberty to lay my apparatus and the phenomena I have observed before the scientists, there may be some explanation, but I have been unable to find any as yet."

"How far have you sent a telegraphic dispatch on the air?"

"A mile and three-quarters. We got results at two miles, but they were not entirely satisfactory. This was at Salisbury Plain, across a shallow valley between low hills."

"What battery were you using?"

"An eight-volt battery of three amperes, four accumulators in a box."

"Did you use a reflector?"

"Yes. It was a roughly made, copper parabolic reflector with a mistake of an inch in the curve. I shall not use one in future, however. A reflector is of no value."

"Nor a lens?"

"Nor a lens."

"Why not?"

"Because the waves I speak of penetrate everything and are not reflected or refracted."

After Professor Roentgen's distances of a few yards and limitations as to substances this was rather stunning. Marconi, however, was entirely serious and visibly in earnest in his statement.

"How far have you verified this belief?"

"Not very far, but far enough, I think, to justify the statement. Using the same battery and my transmitter and receiver, we sent and received the waves, at the General Post Office Building, through seven or eight walls, over a distance of 100 yards."

"How thick were the walls?"

"I can't say. You know the building, however. It is very solidly constructed."

"And you sent an ordinary telegraphic dispatch by those signals?"

"No. We did not do that, though we could have done so. We were working with agreed signals, and we obtained the taps which we sought, and repeated them till there was no room for doubt."

"Do you think that sitting in this room you could send a dispatch across London to the General Post Office?"

"With instruments of the proper size and power, I have no doubt about it."

"Through all the houses?"

"Yes."

We were in a drawing room in Talbot road, Westbourne Park, a distance of about four and one-half miles from the General Post Office.

"And how far do you think a dispatch could thus be sent?"

"Twenty miles."

"Why do you limit it to 20 miles?"

"I am speaking within practical limits, and thinking of the transmitter and receiver as thus far calculated. The distance depends simply upon the amount of the exciting energy and the dimensions of the two conductors from which the wave proceeds."

"What is the law of the intensity at a given distance?"

"The same as the law of light—inversely as the square of the distance."

This means that whatever the energy with which the waves are sent out, their power at, say, 20 feet, when compared with their power at 10 feet, would be in the proportion of 10 by 10 to 20 by 20, or one-fourth, in this special instance.

"Do you think they are waves of invisible light?"

"No. In some respects their action is very different."

"Then you think these waves may possibly be used for electric light-houses when fog prevents the passage of light?"

"I think they will ultimately be so used. A constant source of electrical waves, instead of a constant source of light waves, and a receiver on the vessel would indicate the presence of the light-house and also its direction."

"But would not the fog interfere with the passage of the waves?"

"Not at all."

"Nor metal?"

"Nothing affects them. My experience of these waves leads me to believe that they will go through an ironclad."

"Concerning the size of the apparatus, how large is it?"

"The transmitter and receiver we have been using at Salisbury Plain and at the Post Office are each about"—he held up his hands to indicate the dimensions—"say, 15 inches by 10 by 8. Small ones, effective enough for ordinary purposes, can be made of half that size."

"What are you working on at present?"

"Mr. Preece and I are working at Penarth, in Wales, to establish regular communication through the air from the shore to a light-ship. This will be the first direction in which my apparatus is utilized—communication with the light-ships. The light-ships lie off this coast at any distance from half a mile to 20 miles or more."

"What length of waves have you used?"

"I have tried various lengths, from 30 metres down to 10 inches."

"Why would not these waves be useful in preventing the collision of ships in a fog?"

"I think they will be made use of for that purpose. Ships can be fitted with the apparatus to indicate the presence of another ship so fitted, within any desired distance. As soon as two approach within that distance, the alarms will ring on each ship, and the direction of each to the other will be indicated by an index."

"Do you limit the distance over which these waves can be sent?"

"I have no reason to do so. The peculiarity of electric waves, which was noted, I believe, by Hertz, is the distance they travel when excited by only a small amount of energy."

"Then why could you not send a dispatch from here to New York, for instance?"

"I do not say that it could not be done. Please remember, however, that it is a new field, and the discussion of possibilities which may fairly be called probabilities omits obstacles and difficulties which may develop in practical working. I do not wish to be recorded as saying that anything can actually be done beyond what I have already been able to do. With regard to future developments I am only saying what may ultimately happen; what, so far as I can now see, does not present any visible impossibilities."

"How large a station would be necessary, assuming the practicability, to send a message from here to New York?"

"A station the size of this room in square area. I don't say how high." The room was 20 feet square.

"What power?"

"Fifty or 60 horse-power would, I think, suffice."

"What would be the cost of the two stations completed?"

"Under £10,000, I think."

"Would the waves go through the ether in the air or through the earth?"

"I can not say with certainty. I only believe they would go that distance and be recorded."

"You say that no lens or reflector is of value. Then the waves would go outward in all directions to all places at the same distance as New York?"

"Yes."

"Do you think that no means will ever be found to stop this progress in all directions and concentrate it in one direction?"

"On the contrary, I think that invention will give us that."

"Do you see any way of accomplishing this?"

"No, not as yet."

"In what other directions do you expect your invention to be first utilized?"

"The first may be for military purposes, in place of the present field telegraph system. There is no reason why the commander of an army should not be able to easily communicate telegraphically with his subordinate officers without wires over any distances up to 20 miles. If my countrymen had had my instruments at Massowah, the reinforcements could easily have been summoned in time."

"Would the apparatus be bulky?"

"Not at all. A small sender and receiver would suffice."

"Then why would it not be equally useful for the admiral of a fleet in communicating with his various ships?"

"It would," said Marconi, with some hesitation.

"Is there any difficulty about that?"

"Yes," said he, very frankly, but in a way which set the writer to wondering. "I do not know that it is a difficulty yet, but it appears to be."

The writer pondered the matter for a moment. Then he asked: "Do you remember Hertz's experiment of exploding gunpowder by electric waves?"

"Yes."

"Could you not do the same from this room with a box of gunpowder placed across the street in that house yonder?"

"Yes. If I could put two wires or two plates in the powder, I could set up an induced current which would cause a spark and explode it."

"Then if you threw electric waves upon an ironclad, and there happened to be two nails or wires or plates in the powder magazine which were in a position to set up induction, you could explode the magazine and destroy the ship?"

"Yes."

"And the electric light-houses we are speaking of might possibly explode the magazines of ironclads as far as light from a light-house could be seen?"

"That is certainly a possibility. It would depend on the amount of the exciting energy."

"And the difficulty about using your instruments for fleet purposes——"

"The fear has been expressed that in using the instruments on an ironclad the waves might explode the magazine of the ship itself."

It is perhaps unnecessary to say that this statement was simply astounding. It is so much of a possibility that electric rays can explode the magazine of an ironclad, that the fact has already been recognized by the English Royal Engineers. Of all the coast defences ever dreamed of, the idea of exploding ironclads by electric waves from the shore over distances equal to modern cannon ranges, is certainly the most terrible possibility yet conceived.

Such are the astonishing statements and views of Marconi. What their effect will be remains to be seen. In the United States alone, considering the many able experimenters and their admirable and original equipments, like Tesla's dynamos, the imagination abandons as a hopeless task the attempt to conceive what—in the use of electric waves—the immediate future holds in store. The air is full of promises, of miracles. The certainty is that strange things are coming, and coming soon.

Another Electrocution.

Arthur Mayhew, the negro murderer of Stephen Powell, of Hempstead, L. I., was put to death in the electric chair at Sing Sing, N. Y., prison at 11.17 A. M., on March 12. It required the united efforts of four keepers to strap the man in the chair. Mayhew protested his innocence to the last. The current used was of 1,800 volts for five seconds, which was reduced to 150 volts for 30 seconds, and then turned on again with the original force 30 seconds more. Death was instantaneous. Mr. Powell was superintendent of the electric light company at Hempstead, L. I. It is a curious coincidence that, on the day Mr. Powell's murderer was electrocuted at Sing Sing, the dynamos at the plant in Hempstead gave out and the town was in darkness that night.

CONDUCTIVITY OF INCANDESCENT CARBON FILAMENTS AND OF THE SPACE SURROUNDING THEM.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, NEW YORK, FEBRUARY 17, AND CHICAGO, FEBRUARY 24, 1897, BY JOHN W. HOWELL.

(*Concluded from page 119.*)

The facts, then, are these: The galvanometer indicates a current flowing, as we designate the direction of currents, from the wire to the negative leg, while experiments prove that the charged molecules which carry the current actually pass from the negative leg to the wire. These facts are entirely in accord with the results obtained by Crookes and others in their investigations of currents in high vacua.

If an alternating current is used to render the filament incandescent, the galvanometer will indicate a current with the connection made to either lamp terminal, because both are equally positive. The current thus produced is a uni-directional one in the galvanometer, and illustrates very well the uni-lateral conductivity between the incandescent filament and the wire.

Mr. Preece states in his paper that lamps which show a blue glow in the vacuous space give stronger "Edison

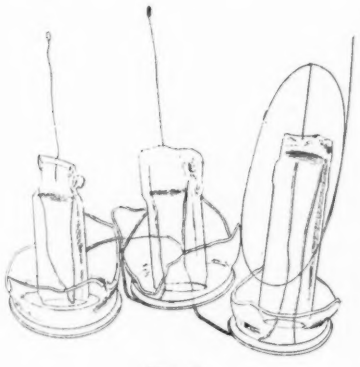


FIG. 8.

Effects" than those which do not show it. Professor Fleming also observes that poorly exhausted lamps give slightly greater effects, but neither of them paid much attention to these lamps.

The blue glow in lamps has long been associated in my mind with a condition of the vacuum which makes it a conductor. Lamps in the process of exhaustion, just before the vacuum is perfected, show this blue very plainly if a little more than normal current is sent through the filament. The blue increases as the current is increased, and becomes very dense at very high temperatures. This blue indicates a current passing from one leg of the filament across the vacuous space to the other leg.

I observed, several years ago, that at a high temperature, .04 or .05 of an ampere, more current flowed through a lamp showing a good blue than through the same lamp, at the same voltage, when the blue had disappeared. I concluded that this extra current flowed through the vacuous space between the legs of the filament.

If a direct current about 20 or 30 per cent greater than the normal current be passed through a lamp filament when the vacuous space shows a blue glow, the positive joint between the filament and the platinum wire gets red hot, while the negative joint remains cool.

I have always considered this as proof that the resistance to the passage of a current through a vacuous space was chiefly at the surface of the positive electrode, as the energy was chiefly developed there. If an alternating current is used, both joints get equally hot.

If a lamp be burned at normal incandescence with a direct current, when the vacuous space shows a good deal of this blue, the negative leg of the filament becomes coated with a carbon soot. This effect can be obtained in a few minutes if the blue is dense and the filament is run above a normal incandescence. This I have considered to be due to an electrolysis of a hydrocarbon gas in the lamp.

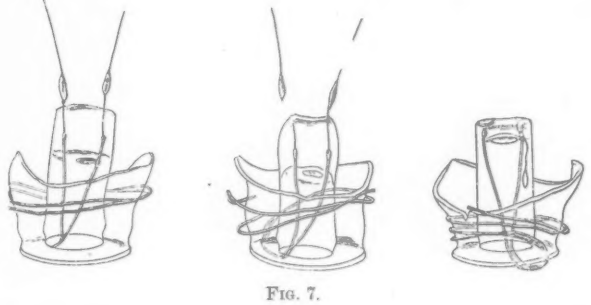


FIG. 7.

The lamps which show only a slight amount of this blue glow, if burned at normal incandescence, will not show this carbon soot perceptibly, and the blue will entirely disappear if the lamp is burned for a few hours. This blue is caused more by the character of the residual gas than by the degree of exhaustion. Lamps having a residual of bromine vapor do not show it at all, neither do they show any "Edison Effect". I have seen ordinary lamps ready to be sealed off the pumps which showed blue and then no blue, and blue again, at regular intervals of a few seconds. Such lamps show corresponding changes in the "Edison Effect".

If the current be gradually increased in a lamp which shows good blue, the positive joint will get hotter and hotter, and finally its platinum wire will fuse. At this stage the resistance to the flow of current across the vacuous space is not great, and if the conditions are such that at this time all the resistance in circuit with the lamp has been cut out, so that the current flowing will be practically determined by the resistance of the lamp and the leads, enough current will flow through the vacuous space to fuse the platinum wires, which are sealed in the glass. This fusion is not due to the same cause as the fusion of the positive joint wire by the vacuum current, because it fuses both positive and negative wires, while the vacuum current fuses only the positive. This fusion of both wires is due to the fact that the low resistance of the vacuous space allows more current to pass than the platinum wire can carry. This is further demonstrated by the fact that a 10-ampere fuse in the circuit will often blow when this happens.

In order to measure the currents which pass from one leg of the filament to the other across the vacuous space, I measured the current at a given voltage of a number of lamps; first, when the lamps showed a good dense blue, before they were well exhausted, and again after the same lamps were well exhausted and showed no blue. Some 55-volt, 24-candle-power lamps showed .4 of an ampere more on the first reading than on the second. All of this .4 of an ampere must have passed through the vacuous space, for the resistance of the filament remained practically unchanged or became a little lower during the operation.

I also measured the currents which passed across the vacuous space when these currents were large enough to fuse the joint wire, and also when they were large enough to fuse both platinum leading-in wires. I found that from one to five amperes passed across the vacuous space when the positive joint wire only was fused, and that when both wires leading through the glass was expanded so by the heat of the current that the glass was shattered, the current measured from 10 amperes to more than 25 amperes.

In order to measure the instantaneous current which shattered the glass, I raised the hand of the ammeter to successively higher points, to find the mark at which the current would just raise the pointer. I used an ammeter measuring 25 amperes, and when the pointer was raised to the 25-ampere mark, the current through the vacuous space caused it to jump beyond this mark.

Figs. 7 and 8 show stems of lamps exhibiting the effects of currents of from one to 25 amperes passing through the wires and the vacuous space. The glass about the wires shows the fusing effect of the current, and the fracture of the glass shows the effect of the expansion of the wires by the heating effect of the current. The undisturbed condition of the glass between the two leading-in wires shows that the current did not pass across the glass, but must have passed through the vacuous space. Gradations of current from one to 25 amperes, used in this experiment,

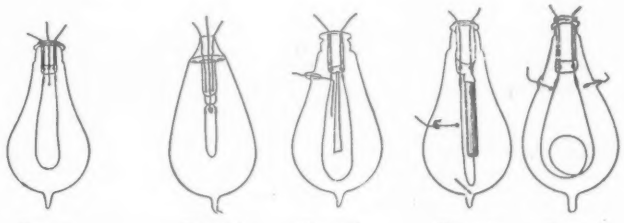


FIG. 9. FIG. 10. FIG. 11. FIG. 12. FIG. 13.

were obtained by regulating the amount of resistance in the circuit when the experiments were made. Unless some resistance had been left in the circuit, all of these lamps would have shown currents as high as 25 amperes or thereabouts, because the conductivity of the vacuous space increases very rapidly when the effect is great enough to start the fusion of the wires.

The lamp shown in Fig. 9 illustrates the fact that the heat produced at the positive joints by the "Edison Effect" current is not simply the result of a mechanical bombardment. This lamp was exhausted to show a good blue. The temperature of the filament was raised sufficiently to cause vacuum currents large enough to heat the positive joint red hot. The outer end of the middle wire was then connected to the positive lamp terminal. When this was done, the positive joint became cool and the middle wire got red hot. This was repeated several times. The middle wire got hot enough to fuse the end, which was platinum. This indicates that most of the heat is caused by the charged molecules coming in contact with some conductor which will carry away their charge. The current was not measured in this experiment.

Fig. 10 shows the lamp used in a similar experiment. The middle wire carried a copper plate about one inch long and one-quarter inch wide. This lamp was exhausted to show a good blue. An ammeter was connected between the middle wire and the positive lamp terminal. As the current was gradually raised, the vacuum current heated the copper plate until it was fused, as shown in the figure. The ammeter in this case indicated over five amperes flowing through the vacuous space between the negative leg of the filament and the copper plate.

I next tried a series of experiments to determine whether the current which passes through the vacuous space when the blue glow is present was the effect of charged molecules moving in straight lines only, from the negative leg, or whether this current would pass around a screen. If a blue glow should appear in lamps with a shield between the legs of the incandescent filament, it would be an indication that the charged molecules under these conditions could carry a current between the two legs in other than straight lines, and if the positive joint should get red hot in such a lamp, it would indicate that the charged molecules pass around an obstacle quite freely. For this experiment I used a lamp with a glass plate two and one-quarter inches long and seven-eighths inch wide between the legs of the incandescent filament. It was necessary to raise the filament in this lamp to a very high temperature before the blue appeared, and then, instead of appearing gradually, as it does in ordinary lamps, it appeared suddenly and in great abundance, and the positive joint got red hot, so that it was necessary to reduce the temperature of the filament to prevent the fusion of the joint wire. As the temperature was reduced, the blue gradually decreased, as it does in ordinary lamps.

When the temperature was so reduced that very little blue was visible, the blue would increase gradually again if the temperature was increased. When the circuit was broken, the filament had to be again raised to the high temperature before the blue again appeared. In this lamp the blue appeared at 136 volts, and remained when the pressure was reduced to 109 volts, but would disappear between 109 and 101 volts.

My next experiment was with a lamp (shown in Fig. 11) having a platinum screen between the legs of the filament and a platinum wire sealed in the side of the bulb and projecting in the vacuous space, with its end bent so as to run parallel with one leg of the filament for about one inch between the filament and the platinum plate. When this filament was heated to about a two-and-one-half watt per candle temperature, the vacuum current did not pass around the screen and no blue showed in the vacuous space. That leg of the filament being negative which was on

the same side of the screen as the wire which was sealed into the bulb, I connected the galvanometer between this wire and the positive lamp terminal. The galvanometer showed a strong current. On breaking the galvanometer circuit, blue appeared on the positive joint and in the bulb. I repeated this several times. It occurred when the temperature was considerably below the temperature necessary to start the blue around the screen.

In each case, connecting the galvanometer between the wire and the positive terminal would cause blue to appear about the inserted wire and the negative leg, and breaking the galvanometer circuit would cause blue to appear on the positive joint, and in the vacuous space about the positive joint, and about the negative leg of the filament.

With this same lamp I observed that when the filament was at a temperature not sufficient to start the blue, if I touched the positive terminal with one finger and the inserted wire with the other, the blue immediately appeared in the vacuous space about the positive joint and the negative leg of the filament.

These experiments demonstrate that in lamps exhausted so as to show a good blue the charged molecules have some difficulty in starting their passage from one leg to another around an obstacle, but maintain their passage after it has been once established. Also that their passage around an obstacle is easily established by starting a flow of charged molecules from the negative leg through a small unobstructed part of the vacuous space to an inserted wire which is connected to the positive terminal, and then breaking the positive terminal connection.

To determine how large a current could be made to flow around an obstruction in lamps exhausted to show a good blue, I used a lamp shown in Fig. 12, having a glass tube about the negative leg and the wire sealed in the side of the bulb, running parallel with the positive leg for about one inch. I connected an ammeter between the inserted wire and the positive lamp terminal, and raised the temperature of the filament until a dense blue appeared in the vacuous space and about the wire and the end of the glass tube. The temperature of the filament was raised until the vacuum current fused the platinum wire which was sealed into the bulb. When this occurred, the ammeter indicated two and one-quarter amperes, and remained at this reading one or two seconds.

Any of the lamps in which the condition of the vacuum is just right, showing the blue glow, will show a current in a galvanometer connected between the wire inserted in the vacuous space and the negative lamp terminal, but in all cases this current is small. One-half milliampere is the largest current I have observed under these conditions.

I next tried some experiments with lamps like the one shown in Fig. 13, which has two wires sealed in opposite sides of the bulb, which project inward to a point near the filament about one and one-quarter inch above the joints. This lamp was exhausted to show a good blue. The galvanometer was connected between the wires which were sealed in opposite points of the bulb. No current was indicated until the temperature of the filament was raised quite high, and the blue glow was quite intense.

Under these conditions the galvanometer indicated a current of .1 milliampere.

I have made experiments upon two lamps containing bromine vapor. One of these lamps, which contained bromine enough to depress the barometric column one-twentieth of an inch, showed no "Edison Effect" when the potential was run up as high as 170 volts, using a 110-volt lamp.

The second lamp had very much less bromine vapor in it, and showed a very slight "Edison Effect". This lamp acted very peculiarly. When first tried it gave an "Edison Effect" which changed very little in value between 105 and 146 volts. At 120 volts the vacuum current showed a deflection of the galvanometer of 14 scale divisions, while at 128 volts it showed a deflection of only 12 scale divisions. I observed this several times. This was quite a large reverse change, as the current at 146 volts only increased enough to give a deflection of the galvanometer of 16 scale divisions. This change was observed on several days, but it was less marked each time it was tried, until it finally disappeared.

The question naturally arises, what causes the blue glow in the vacuous space? The glow is luminous, and luminosity can only come from matter; consequently we conclude that the vacuous space, when blue shows, is filled with luminous molecules, and as these molecules are not of themselves luminous, we must seek for the cause of their luminosity.

We have seen that the negatively charged molecules liberate considerable energy on coming in contact with a body that conveys away their charge. We have also seen that when the blue glow is present there is a considerable flow of charged molecules through the vacuous space, and that the naturally rectilineal movements of these molecules are disturbed.

We also know that molecules are emitted from the positive leg about as plentifully as from the negative leg, although these molecules do not carry a positive charge.

The conclusion seems to be that the blue glow is a manifestation of the energy developed by the meeting of the charged molecules with other molecules, which take away part or all of their charge.

Well exhausted incandescent lamps which have burned a long time show a black deposit on the inner surface of the bulb. In lamps with thick, stiff, single-loop filaments, in which the two legs lie in the same plane, a light line may be observed in the black deposit, which is caused by the shielding of this line by one leg from the molecules emitted by the other leg. This line shows with about equal clearness opposite both legs, indicating that carbon molecules are constantly emitted from both legs, equally and in straight lines.

In lamps which have been imperfectly exhausted the black deposit sometimes appears in patches, symmetrically placed with reference to the carbon. I regard these figured discolorations as indications of disturbances in the rectilineal paths of the molecules, and of the influence of the magnetic field upon the disturbed molecules.

The activity of the molecules carrying current across the vacuous space seems to depend more on the temperature of the filament than on the potential difference between the legs, 40-volt lamps showing about as strong effects as 140-volt lamps. The energy they exhibit in one direction seems to be very much greater than we would expect from molecules actuated by a potential difference of only 40 or 50 volts. The action of these molecules in carrying electricity in one direction only may be an indication of the nature of the action between molecules in solid conductors carrying currents, rather than an illustration of the action of statically charged molecules.

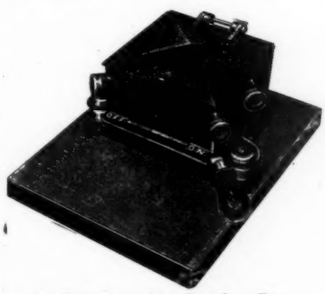
A $30,000 Gift to the Stevens Institute of Technology.

It may be remembered that in connection with the 25th anniversary of the Stevens Institute, recently celebrated, President Morton drew attention to the circumstance that while the original endowment and subsequent gifts had supplied all that was necessary for present requirements, the natural and necessary growth of the institution would make more ample accommodations and a larger revenue essential for an adequate future development of the work which had been so successfully carried on heretofore.

As an object lesson in this direction, he presented on the same occasion to the trustees some shares of stock likely to appreciate as the years progressed. This suggestion, we learn, has been acted upon by Mrs. E. A. Stevens, widow of the founder of the institute, who has transferred to the trustees two large lots and houses directly adjacent to the institute grounds, which, while having at present a valuation of about $30,000, have a prospective value many times as great.

An Improved Arc Cut-Out Box.

Mr. T. H. Brady, New Britain, Ct., has patented a new arc cut-out box, which is constructed on a



An Improved Arc Cut-Out Box.

new principle, and is claimed to minimize the danger of burning out. Aside from the insulation in the interior of the box, it has double insulation when put in position, as the box is attached by hooks setting into grooves in porcelain knobs. This reinforcement of the usual interior insulation makes the box perfect in insulation, and it is likely to save central stations much of the annoyance always experienced from the burning out of the cut-out boxes. The mechanical construction is such that the lever can not be centered, and is positive in the make and break. The spring jaws are adjustable, and are made of phosphor-bronze.

Mr. Arthur Wright, general manager of the large Brighton, Eng., electric station, has accepted an invitation from the National Electric Light Association to read a paper at the Niagara Falls' meeting. The paper will be on the subject of the profitable extensions of central stations. Mr. Henry Reason, of the Reason Manufacturing Company, and Mr. W. L. Madgen, of *Lightning*, will visit America, in company with Mr. Wright, in order to attend the meeting of the National Electric Light Association.

Is Tom Johnson To Be Trolley King?

[*From the Detroit Journal.*]

Tom L. Johnson, the king of the street railway combinations, the man who has so successfully brought every street car in the city under his hand, is at work on the same sort of thing down in Brooklyn. Recently, in that city, a meeting was held, attended by a representative of every company in the city, for the purpose of discussing a combination of the lines in that city. Those in favor of the project showed how a saving could be made should a combine be brought about, but the meeting hitched when the point of sharing the receipts was brought up. The whole stopped there, and some of the Brooklyn papers express the opinion that this one thing will check the whole business. A suggestion of pooling was made, but this was found to be impossible on the ground of being illegal. Then it was proposed that a new company be organized to lease all the existing railroads, and then there were some who considered it wiser to have one of the larger companies lease the other lines.

It is believed that Tom Johnson will succeed, however, in bringing all the street railways of Brooklyn under one management, and he is thought to be cherishing the vast scheme of uniting all the railways in which he is interested under one company, of which he shall be president. He will then be the greatest street railway power on the continent. Such a combination would include all the street railways of Cleveland, Detroit, Brooklyn, Jersey City, and a smaller city in Pennsylvania.

Re-Rolling Worn Rails.

The following account of a remarkable process, published in the *Wall Street Journal*, should be of interest to electric railway men:

Some time ago Mr. McKenna, one of the officers of the St. Paul road, devised a system for re-rolling worn steel rails, so as to make them available for fresh use and as good as new rails. A contract has now been made to build a mill, which will be running by about June 1, and orders for about 30,000 tons of rails have already been promised. Under this process there is necessarily some diminution in the weight of the section, but there is an increase in length. Experiments tried with rails for the St. Paul road resulted in a reduction of the section from 66 pounds to 60. Of the rails delivered to the mill, however, 93.2 per cent by weight were returned as perfect rails, and by length 103.1 per cent was returned.

Judge Swan, of the United States Circuit Court, has refused to appoint a receiver for the Consolidated Street Railways, of Saginaw, Mich. The Boston Safe Deposit and Trust Company made the application, which Judge Swan refused, on the ground that the mortgage held by the complainant provides for a six months' default in the payment of interest, whereas only 15 days' default was charged in the bill.

TELEPHONE NEWS AND COMMENT.

The independent telephone company in Toledo, Ohio, has 800 telephone subscribers.

The State Telephone Company was incorporated at Albany, N. Y., last week, with a capital stock of $200,000.

The Hudson River Telephone Company, Albany, N. Y., reports for the year ending December 31, as follows: Gross, $299,999; increase, $23,245; net, $95,651; increase, $3,008.

The anti-Bell telephone company at Fort Wayne is a very successful one. There are over 1,200 subscribers at that point, and Mr. George W. Beers is the active president of the company.

A movement has been begun to introduce a new telephone system in Tarrytown, N. Y., which, it is said, will give service at great reduction from the present rates of the Westchester Telephone Company.

The New England Telephone and Telegraph Company will receive until 12 M. Saturday, March 20, tenders for the sale and surrender on Thursday, April 1, of its first series six per cent bonds, due April 1, 1899, and numbered from 1 to 500, inclusive, and its second series six per cent bonds, due April 1, 1900, and numbered from 50 to 1,000, inclusive.

A war between the Telephone and Telegraph Construction Company, of Detroit, which controls the Bell service in that territory, and the new independent companies of Michigan, is on, and will be carried on in all towns where independent exchanges have been established. Rates have been cut, and as rapidly as State lines are ready for business the rates will be cut from 25 to 50 per cent. The contest, it is said, will be particularly fierce during the coming Summer.

The Home Telephone Company, recently organized in Los Angeles, Cal., contains among its incorporators the names of some of the city's more prominent business men and capitalists, and is meeting with success in securing subscribers to the exchanges it proposes to establish in Los Angeles, San Diego, Pasadena, and a number of smaller towns in the southern part of the State. F. W. Brann, president; A. B. Cass, vice-president; A. C. Jones, treasurer; Louis F. Vetter, secretary; Chas. E. Severance, general manager.

At the annual meeting of the New York & New Jersey Telephone Company, Brooklyn, N. Y., the following directors were elected without opposition: Charles F. Cutler, Alexander Cameron, Joseph P. Davis, Charles A. Nichols, Hugh Kinnard, William D. Sargent, David B. Powell, George H. Prentiss, Joel C. Clark, Felix Campbell, Edward J. Hall and Henry Sanger Snow; for inspectors of election, Charles T. Young, John H. Cahill and Waldron Hoppins. The treasurer's report contained the following items: Gross earnings, $1,554,585.33; expenses, $1,076,854.76; balance on hand over and above operating expenses, $477,730.66; interest and taxes, $107,268.72; net earnings, $370,461.94. Of this, $253,363 was set aside for dividend purposes, leaving a surplus for 1896 of $117,098.94.

President and General Manager John Income Sabin, of the Pacific Telephone and Telegraph Company, San Francisco, is one of those progressive men who went West in the early electrical days to grow up with the telephone poles. He grew, so did his telephone business, as is proven by the following figures:

CENTRAL SYSTEM STATIONS, SAN FRANCISCO.

December 31, 1895...6,372...Gain for year.....1,311
December 31, 1896...7,810...Gain for year.....1,438
February 28, 1897...8,333...Gain for two months, 513

Mr. Sabin is sending out, just now, a number of artistic leaflets, filled with convincing text, relating to the merits of a telephone, and another one if the first is kept too busy. The telephone directory covers the State of California, and 18,263 subscribers look to Mr. Sabin for telephonic satisfaction.

There was an important gathering of the independent telephone interests in New York last week at the Hotel Imperial. The State associations of Indiana, Ohio and Pennsylvania were represented as follows: Indiana, Hon. Hugh Dougherty, of Bluffton, and Mr. George W. Beers, of Fort Wayne; Ohio, Judge J. N. Thomas, of Chillicothe, and Hon. M. D. Shaw, of Wapakoneta; and Pennsylvania by Mr. Burt Hubbell, of Pittsburgh. The meeting was called for the purpose of discussing the best method of forming a long-distance organization to connect the independent telephone systems of these States. While no definite announcement was made, it was understood that the meeting was a very satisfactory one, and that the gentlemen present will promptly report to their different State organizations the result of the conference.

Electric Light Man Sues for Damages.

Lionel V. Nelson, superintendent of the Middletown Borough Electric Light Works, has brought suit against Harry J. Horst, of Middletown, Pa., for the recovery of $5,000 damages. The statement in the case recites that Nelson has always borne a good reputation in Middletown and always demeaned himself with credit. Horst is declared to have stated that Nelson stole a lubricator from the borough of Middletown and gave it to W. W. McCleary, and also kept him supplied with machine oil; alleged to be false statements.

The Los Angeles Terminal Railway, S. B. Hynes, general manager, is about to electrically equip its Pasadena and Glendale lines, in all about 13 miles, and is meeting with determined opposition from the established electric road, the Pasadena & Pacific.

ELECTRIC LIGHT FLASHES.

It is reported that Baltimore capitalists will build an electric water-power plant on the Holston River at Bristol, Tenn. The plant will cost $100,000.

The Canandaigua, N. Y., Electric Light and Railroad Company has been sued for $10,000 damages by William Davis, of Geneva, who was injured while working on a boiler at the Littleville plant.

At the annual meeting of the Patchogue, N. Y., Electric Light Company the old officers were re-elected; namely, John S. Havens, president; Jessie C. Mills, vice-president; Jas. H. Mills, treasurer; Geo. D. Gerard, secretary.

An attachment has been placed on all the real estate of the Woonsocket, R. I., Electric Machine and Power Company, by Deputy Sheriff Samuel E. Gardner, of Providence. The suit was brought by the Electric Storage Battery Company, of Philadelphia, and is for $40,000.

At the annual meeting of the stockholders of the Edison Electric Light Company, of Schenectady, N. Y., the following directors were re-elected for the ensuing year: Edward Clark, H. W. Darling, Thomas A. Edison, S. Dana Greene, H. B. Schuyler, J. R. Lovejoy, John Kruesi and M. F. Westover.

Suit will be filed in Common Pleas Court, at St. Clairsville, Ohio, by the Electric Light Company, of Bridgeport, against the city of Martin's Ferry, for $5,000 damages. The suit was brought about by the Martin's Ferry council having a number of poles belonging to the company, in that city, cut down some time ago.

A corporation, to be known as the Southern California Power Company, San Bernardino, Cal., has been organized with a capital stock of $1,000,000. The principal stockholders are Henry Fisher, of Pittsburgh, Pa., and H. H. Sinclair, president and manager of the Redlands Electric Light and Power Company. The present place of business of the corporation is Redlands. The purpose of the company is to develop power from the Santa Ana River, by taking the river out at the junction of Bear Creek and the Santa Ana River, carrying it in a cement ditch and tunnels about four miles, thus securing a fall of 1,000 to 1,100 feet, and then running the water again into the stream. The power will be transmitted by pole line, 75 miles from Los Angeles, there to be used to supplant steam power, now used to develop electricity for lighting and railroad companies. It will be the longest line and the highest voltage (30,000 volts) in use in the world. The line will run through San Bernardino, Pomona, Ontario and Pasadena, and will be able to supply all power needed in these towns. Work will be begun in the Santa Ana cañon as soon as surveys are completed, which will be April 1. It is proposed to deliver power into Los Angeles by January 1, 1898.

LITERARY.

"Electric Power Transmission: A Practical Treatise for Practical Men," by Louis Bell, Ph.D. Cloth, 491 pages, 229 illustrations. Price, $2.50. Sent post free on receipt of price by ELECTRICAL REVIEW Publishing Company, Times Building, New York city.

This volume is designed to set forth in the simplest possible manner the fundamental facts concerning present practice in electrical power transmission. Busy men have little time to spend in discussing theories of which the practical results are known, or in following the derivation of formulas which no one disputes. The author has therefore endeavored, in introducing such theoretical considerations as are necessary, to explain them in the most direct way practicable, using proximate methods of proof, when precise and general ones would lead to mathematical complications, without altering the conclusion for the purpose in hand, and stating only the results of investigations when the processes are undesirably complicated.

In writing of the many-sided and rapidly changing art, it is impossible, in a finite compass, to cover all the phases of the subject, or to prophesy the modifications that time will bring forth; hence the epoch of this book is the present, and the point in view chosen is that of the man, engineer or not, who desires to know what can be accomplished by electrical power transmission, and by what processes the work is planned and carried out. This treatment is of great value to the student who wishes to couple his investigations of electrical theory with its application in the hands of engineers, and puts the facts regarding a very great and important development of applied electricity in the possession of the general reader.

Such apparatus as is described is intended to be typical of the methods used, rather than representative of any particular scheme of manufacture or fashion in design. These last change almost from month to month, while the general conditions remain fairly stable, and the underlying principles are of permanent value.

Printer Laureate of the United States.

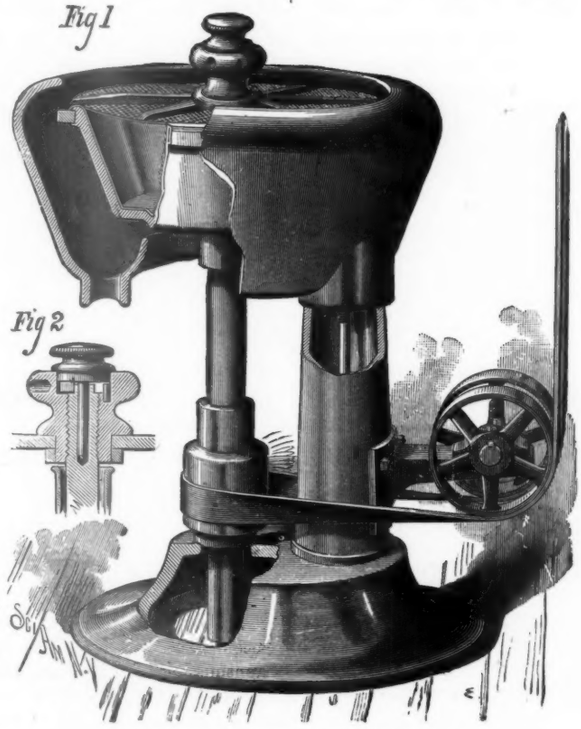
The electrical fraternity will be pleased to learn that Mr. Louis H. Orr, of Bartlett & Company, New York city, the well known high art printers, has been elected, by popular vote, the printer laureate of America. Some time ago the Campbell Company, manufacturers of printing presses, inaugurated a voting contest for the most popular printer in the United States. The total number of votes cast was 19,878. Of these Mr. Orr received 5,789, a plurality of 497 votes over his nearest competitor. In addition to the honor of being elected, by popular vote, printer laureate of the United States, the Campbell Company presented to Mr. Orr, as a prize, a "Century" pony printing press. The ELECTRICAL REVIEW joins with Mr. Orr's many friends in congratulating him on his newly acquired honor.

A Centrifugal Oil Separator.

A centrifugal oil separator, designed by Weston, to thoroughly and quickly remove the oil from the metal turnings formed in the manufacture of bolts and screws, and for small articles, such as bolts, screws and nuts, which in their manufacture are coated with oil, is now being placed on the market by the Garvin Machine Company, of New York and Philadelphia.

Fig 1

Fig 2



THE WESTON CENTRIFUGAL OIL SEPARATOR.

The oil separator is about 30 inches high, requires a floor space of 20 inches square, is adapted to run at a speed of about 2,000 revolutions per minute, and produces no noise or jar in operation. It is made with shaft and hanger. Those who have used the machine estimate that the saving of oil in a manufacturing establishment consuming annually from 8 to 10 barrels of oil will be amply sufficient to warrant the purchase of the oil separator.

The revolving drum is within a removable pan in which the oily chips, turnings or screws are placed, the pan being removed to discharge its contents when the oil has been turned off between it and the metal cover, locked down by a lock-nut. The oil discharged into an outer casing is delivered through an outlet into a suitable vessel ready to be used over again.

Press advices state that the plant of the Jenney Electric Motor Company, at Indianapolis, Ind., was destroyed by fire last Friday. The loss is estimated at $100,000, with $35,000 insurance.

ITEMS OF INTEREST.

A director of the Manhattan Elevated is reported as saying that the company will equip their road with electricity, using the third-rail system. The change will cost probably $5,000,000, which will cover power house and the estimated loss through discarded rolling stock.

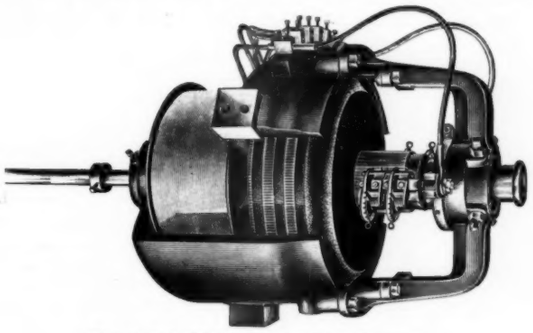
A press dispatch from Albany, N. Y., on March 12, states that Assemblyman Sullivan's bill providing that no electric light company shall charge more than three-quarters of a cent per hour for each incandescent light and four cents per hour for each arc light has been advanced to second reading in House.

The success of the influence machine for X-ray work seems no longer in question. The recent development made by the L. E. Knott Apparatus Company, of Boston, marks an epoch of great importance. The design now made proved so successful that many who had been waiting for more satisfactory results before purchasing at once placed their orders. Many retail houses have already placed large orders, and the manufacturers report that it is with difficulty that they are able to turn out these machines fast enough to supply the demand.

THOMAS HILL, Jr.,
Electrical Manufacturer
AND CONTRACTOR,
No. 128 WATER ST.,
NEW YORK.
Telephone, Electric Light and Power Installations. All kinds of Electrical Repairing promptly attended to.

New "C & C" Motor For Boat Service.

In line with the specific adaptation of electrical machinery, the C & C Electric Company, of 143 Liberty street, New York, have perfected a small motor—an illustration of which is shown herewith—for use in a small boat, or electric launch, or for torpedo propulsion. Because of its peculiar shape and compactness, it may be used in a number of cases where standard forms could not be employed.



NEW "C & C" MOTOR FOR BOAT SERVICE.

The field magnet is energized by a single coil, wound on the core of a magnet, which is concentric with the armature shaft. The pole pieces are fastened to the end of the core and brought to one side of the coil, leaving a space between their polar surfaces equivalent to the diameter of the coil spool. The armature revolves between these pole pieces, one end of the shaft projecting concentrically from the field core supported in a bearing at the outer end, the commutator end being held in a bearing supported by two arms fastened to the outer edge of the pole pieces. This construction gives the diameter of the cylinder scarcely more than that of the armature, making the machine cylindrical in form. The motor is constructed on the standard C & C principle and is fully self-contained, and may be fastened at the points, or at the end of the field core, to any base or machine. The commutation is almost sparkless, and the magnetic circuit very short. In designing this type of the C & C motor the aim has been to minimize weight and size and accomplish the best results in strength and operation. These motors are built to operate at any commercial speed, and because of the large armature, run particularly well at low speeds.

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UPRIGHT AND HORIZONTAL SHAFTS.
Specially Designed and Adapted for Driving
Electric Lighting and Power Plants
Our late new Wheel secures a remarkably **high guaranteed percentage**, and **wonderful steadiness** of motion, under variable loads in practice. It affords an **unequalled concentration** of power within a small space; and an **unprecedented high velocity** for a given power.
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AUTOMATIC CIRCUIT BREAKER COMPANY, NEWAYGO, MICHIGAN, U. S. A.

ADVANCE INFORMATION

New Electric Railways.

HOUGHTON, MICH.—A company is being organized to build an electric railroad between this place and Hancock.

NEWBURYPORT, MASS.—A new electric road will probably be constructed over Pine Island to Sandy Beach.

KEENE, N. H.—The Keene Electric Railway Company have been granted permission to construct an electric railroad.

CHARLESTON, S. C.—The Charleston Street Railway Company has awarded Henry Oliver contract for the erection of building for its electric plant. Work will be commenced immediately.

CROSWELL, MICH.—City Clerk may be addressed concerning prospective electric railway.

BRIDGEWATER, MASS.—The Bridgewater, Whitman & Rockland Railway Company have been granted franchise for street railway.

DETROIT, MICH. — The Benton Harbor Electric Railway & Transit Company, which was recently incorporated with a capital stock of $650,000, has let contract to the Century Engineering Company, of Cleveland, for construction of 100 miles of railway between this and neighboring cities.

CINCINNATI, OHIO—The Cincinnati, Hamilton & Dayton Traction Company are endeavoring to secure franchise to construct new electric railroad through the village of Carthage and over the Springfield Pike.

SPRINGFIELD, MASS. — The Amherst-Sunderland Street Railway Company will erect an electric plant at North Amherst, which will be driven by water power from Dwight Graves's dam.

CHAPEL HILL, N. C.—An electric railway will probably be constructed between this city and Durham.

DETROIT, MICH.—A 60-mile trolley road will be built between Detroit and Port Huron.

GRIFFIN, GA.—Moore & McCray, engineers, Atlanta, Ga., will receive proposals, April 1, for all machinery and labor for power transmission from High Falls to Griffin.

WINSTED, CT.—In the Superior Court here, Judge A. H. Fenn granted a petition for the construction of a trolley road from Torrington to Winsted, paralleling a portion of the Naugatuck division of the New York, New Haven & Hartford Railroad.

BOWLING GREEN, OHIO—An effort is being made to organize a company to build an electric railway from this place to Bloomdale.

WORCESTER, MASS.—An electric railway is contemplated from Marlboro through Southboro and Fayville to South Framingham. Arrangements are practically completed for beginning work on the Worcester and Marlboro Street Railway.

HOUGHTON, IND.—A company is being organized to build an electric railroad between this place and Hancock.

ALBANY, N. Y.—The Olean, Rock City & Bradford Railway Company has been incorporated, with a capital stock of $100,000.

Electric Light and Power.

CLARKSVILLE, TENN. — Thomas Bourne can give information about a company which is being organized, with a capital stock of $10,000, to supply the city with electricity for lighting.

ST. MARY'S, W. VA.—O. H. Suck can give information concerning erection of an electric light plant.

COLOMA, MICH.—An electric light plant will probably be established.

GRENADA, MISS.—B. C. Adams, Mayor, may be addressed concerning erection of electric light plant.

MAXTON, N. C.—A. J. Cottingham contemplates establishing an electric light plant in his planing mill.

MARTIN, TENN.—J. E. Kennedy, Mayor, may be addressed for information concerning construction of electric light plant.

DEADWOOD, S. D.—A. D. Steward, of this city, and J. C. Wells, of Galena, are negotiating with the council and citizens of Sturgis for the privilege of putting an electric light system in the city, and for the right of way through the city for an electric motor line from the Elkhorn depot to Fort Meade.

ELMORE, OHIO—The council are again agitating the question of electric lights.

LANCASTER, KY.—A franchise has been granted George Patterson to put in an electric light plant here, the town agreeing to pay $750 per annum for lighting the city.

EDINBURG, IND.—The citizens of this city are agitating the question of electric light and have signified their intention of putting in a plant, to be owned and operated by the town.

LOCKPORT, N. Y. — The Holly Manufacturing Company is contemplating putting in an electric plant of its own.

CANTON, IOWA — Maquoketa has formed a corporation for building an electric light plant at this place, to be run by water power and furnish lights for Maquoketa.

UKIAH, CAL.—An electric light plant is to be established here.

HARRIMAN, TENN. — The City Council is taking steps for the erection of an electric light plant here, with a capacity of 2,000 lights. The legislature will be requested to authorize the issuance of bonds for this purpose.

SCOTTSVILLE, N. Y.—There is some prospect of this place having an electric light plant in the near future. The village has sufficient water power, and if pledges for 300 lights can be secured a dynamo will be put in.

"Dixie." The Southern Industrial Journal, tells the truth about Southern conditions and possibilities. If you are interested, send 25 cents for 3 months or $1 per year. THE "DIXIE" CO., Atlanta, Ga.

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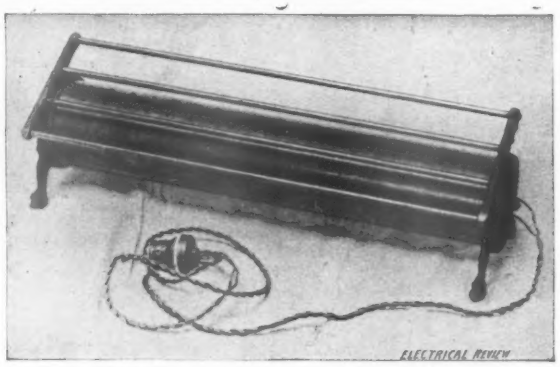
PLEASE STATE VOLTAGE WHEN ORDERING.



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Six inches high, 20 inches long. Consumes one-half and one ampere on 110-volt current. Temperature of heater, 360 degrees. Can be attached to any lamp circuit by cord and attachment plug. Will work on D.-C. or A.-C. current and any voltage. Made in Bronze, nickel and plain black finish.

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LARGEST PLANT IN THE WORLD.
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SEND FOR CIRCULAR.
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Illustrated Catalogue sent free on application.

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NIAGARA FALLS, N. Y.

Kindred.... ...Interests

The Electric Appliance Company, Chicago, are just distributing to the trade a catalogue containing a complete line of Anchor snap switches. This is probably the most complete catalogue of snap switches that has been published, and includes a number of new applications of the snap switch, also a complete line of dial or indicating switches. The Electric Appliance Company have prepared a special trade discount sheet for this catalogue, which quotes up-to-date prices on the goods listed. They will be glad to receive requests for the catalogue.

The Metropolitan Electric Company, of Chicago, have taken the agency for a line of desk lamps covering a number of different styles, such as adjustable stand lamps, pivoted portables, roll-top desk lamps, bracket lamps, adjustable ball hangers, all with the most approved shades in different finishes. A good desk lamp is a matter of interest to every office man, and in the illustrated circular, being issued by the Metropolitan Electric Company, will be found a complete line of well assorted desk lamps that commend themselves to the public.

A New Supply Company—B. H. Ellis, president and manager, and C. P. Scott, vice-president and secretary, have issued the following circular:

Having been in the electrical business for the past 10 years, we desire to call the attention of our friends and the trade in general to the Eastern Electrical Supply Company, No. 26 Cortlandt street, New York, which we have organized for the purpose of carrying on an electrical supply business in all its branches, and can promise, should you favor us with your business, that all orders will have our personal and prompt attention. We are prepared to execute orders at the lowest possible prices.

The Exposition of 1898—The Chicago & Northwestern Railway has just announced a subscription of $30,000 to the stock of the Trans-Mississippi and International Exposition to be held at Omaha next year. The Burlington road, more than a month ago, subscribed $30,000. The Rock Island and Union Pacific will each subscribe $25,000, the Missouri Pacific $20,000, and the Milwaukee $20,000. The total stock subscriptions now amount to $438,480, and the promised subscriptions of the railways will raise the total to $528,480. Z. T. Lindsey, manager of the department of ways and means, expects to secure at least $1,000,000 in stock subscriptions.

The Garvin Machine Company, New York and Philadelphia, have just issued a small booklet of a large list of new and second-hand machinery, all of which are ready for immediate delivery. Aside from being most extensive manufacturers, this company are agents for the following machine and tool manufacturers: W. F. & John Barnes Company's lathes and drills; P. Blaisdell & Company's lathes and drills: Whitcomb & Powell planers; Flather's lathes and shapers; the Bradford Mill Company's lathes; Hendey Machine Company's shapers, planers and lathes; D. Slate Machine Company's sensitive drills; Diamond Machine Company's emery grinders; the Smith & Silk crank and geared shapers; Cushman, Union, Sweetland, Skinner, Monarch, Horton and Almond lathe and drill chucks.

The Bossert Electric Construction Company, of Utica, N. Y., has been obliged by the growth of its business to arrange for larger quarters. Plans have just been completed for a new building, which will be erected in the western part of the city. It will be 48 by 88 feet on the ground, two stories high, prepared for three, and will be built of heavy timber-work. There will be three lines of shafting on the first floor, which will be occupied by heavy machinery. Heavy stone foundations will be built for the presses which stamp out the company's new steel-clad junction boxes, the largest press giving a blow equal to 84 tons weight. On the first floor also will be the office, 14 by 15, a private office, 10 by 15, and opposite these will be a large storeroom. The lighter machinery will be on the second floor. Near the building, separated by an alley, will be three brick buildings. They will be an enameling room, 20 by 21 feet, engine room, 15 by 10 feet, and boiler room, 15 by 21 feet, with coal shed attached.

ELECTRIC LIGHT PLANT.

Tippecanoe City, Ohio, will receive bids until noon, March 26, 1897, for the erection of an ELECTRIC LIGHT PLANT, 60 to 90 kilowatts capacity, direct-current system. Specifications can be had by addressing

JOHN M. HAAGA,
Village Clerk.

WANTED—SITUATION in the electrical business by a young man 19 years old. Graduate of Packard's Business College, and have had practical experience in ELECTRIC LIGHT and POWER STATIONS.

Good references and moderate salary, with prospect of advancement.

Address

"W. C. K.,"
96 Prince Street, NEW YORK.

MASTER WORKMAN,

who has successfully been engaged for 15 years in the manufacture of battery and electric-light carbon, desires to settle in the United States.

Proposals should be addressed to H. S., 6143,

RUDOLF MOSSE,
Hamburg, Germany.

WATER-POWER FOR SALE.

120 Horse-power Turbine Water-wheel Wheel-house. Two-story brick building, 36x171 feet; also main line shafting. Power reliable. On two railroads. About four hours from New York and Boston.

Apply to
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WEST WINSTED, CONN.

WANTED—Position by an all-around electrician. One who has had six years practical and business experience in all branches, capable of installing and operating any piece of electrical apparatus, from a bell to an electric light or power station. Would like good position in any branch, or would travel for good company. Best of references. Address,

"BUSINESS,"
Care of ELECTRICAL REVIEW, New York.

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(Stationary, Locomotive or Marine); Mechanics; Mechanical Drawing; Electricity; Architecture; Architectural Drawing and Designing; Civil, Railroad, Bridge, Municipal and Hydraulic Engineering; Plumbing; Mining; Prospecting; English Branches.
The Steam Engineering course is intended to qualify engineers to secure Licenses.
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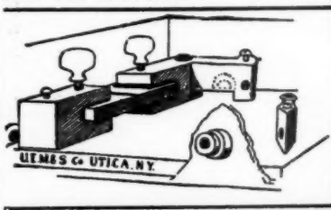

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TRAFFIC PROMOTERS.
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Platinum in sheet and wire, all sizes, and any degree of hardness. Scrap and native Platinum purchased
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ELECTRICAL PATENTS.

ISSUED MARCH 9, 1897.

578,122 Combined telephone and annunciator system; J. R. Strong, New York—A switch having a series of yielding contact arms and a corresponding series of stationary contacts, with circuit connections running to independent calling circuits, and an annunciator provided with an independent drop for each pair of such contacts, with controlling mechanism having movement over said yielding contacts, and provided with an indicator adapted to indicate the number of the circuit to be controlled or affected.

578,126 Telegraphy; R. H. Weiny, Arlington, N. J.—An automatic transmitter provided with a conducting transmitting arm, and a straight stiff spring adapted to make mechanical contact with the embossments of a transmitting fillet, with an arm adapted to act as a guide for said transmitting fillet, said arm being provided with a downward or angular inclination at one side of the conducting transmitting arm, whereby the embossments, after carrying said movable arm to the extreme limit of its stroke, are released as the fillet is drawn forward.

578,139 Electric switch; W. W. Doty, New York—An electrical switch, provided with a pair of solenoids adapted to be energized by a current under the control of the operator in charge of an approaching car, and bell-crank levers connected with and operated by the said solenoids, and adapted to engage the switch point on opposite sides, to shift the latter from the main track to the side track, or vice versa.

578,171 Electrolytical apparatus; C. P. Turner, New York.

578,182 Apparatus for regulating and modifying electric circuits; G. F. C. Adams, Hanover, Germany—A current switching device, composed of a main switch for connecting the motor with the line wire or storage battery, and also connecting the battery with the line wire, and two additional switches, of which one controls the motor and resistance, and the other switches the battery in series or parallel, which two switches are so connected as to permit each to perform its function, but to return to the initial position together.

578,233 Electric arc lamp; Anton Guendel, New York.

578,266 Oil, gas or like engine; W. Rowbotham, Birmingham, Eng.—A working cylinder or combustion chamber of an explosive engine, electrodes arranged to pass a silent electric discharge through the explosive mixture in said cylinder or chamber.

DYER & DRISCOLL,
PATENT SOLICITORS,
36 WALL STREET, N. Y.,

Have done all my patent soliciting work, both for this and foreign countries, continuously for the past fourteen years.

Thomas A. Edison

PATENTS.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works Olympia, Oregon.

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Wanted—An Idea Who can think of some simple thing to patent? Protect your ideas; they may bring you wealth. Write JOHN WEDDERBURN & CO., Patent Attorneys, Washington, D. C., for their $1,800 prize offer and list of two hundred inventions wanted.

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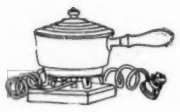

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$3.00

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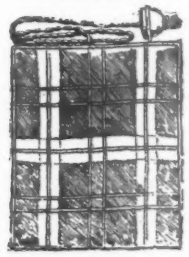

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We study the requirement in every specific case and adapt the machinery and equipment which is sure to produce results most economically and satisfactorily. You can at least correspond with us and learn about some of our modern work.

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